
A New Species of *Croton* (Euphorbiaceae) from Ecuador

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ABSTRACT. A new species of *Croton* (Euphorbiaceae) from the western slopes of the Andes in Ecuador is described. *Croton floccosus* is a medium-sized tree that is common along streambeds and disturbed sites in the Pichincha and Imbabura provinces of Ecuador. This species appears most closely related to the Colombian species *C. polycarpus* Benth., *C. mutisianus* Kunth, and *C. magdalenensis* Müller Argoviensis in section *Cyclostigma* Grisebach, but differs in having staminate flowers with gland-tipped petals, 15 or 16 stamens with pubescent filaments, and long pedicels (7–16 mm); small fruits (6.4–7.7 mm diameter); and entire to dentate stipule margins. Because of its apparent affinity with these Colombian species, I place *Croton floccosus* in section *Cyclostigma*.

RESUMEN. Se describe una nueva especie de *Croton* (Euphorbiaceae) de las vertientes occidentales de los Andes en Ecuador. *Croton floccosus* es un árbol mediano que es común al lado de arroyos y sitios alterados en las provincias de Pichincha e Imbabura en Ecuador. Esta especie parece estar más cercanamente relacionada con las especies colombianas *C. polycarpus* Benth., *C. mutisianus* Kunth y *C. magdalenensis* Müller Argoviensis en la sección *Cyclostigma* Grisebach, pero difiere por tener las flores estaminadas con pétalos glandulares en el ápice, 5 ó 16 estambres con los filamentos pubescentes y los pedicelos largos (7–16 mm); frutos pequeños (6.4–7.7 mm); y los márgenes de las estípulas enteros o dentados. Debido a su afinidad evidente con estas especies colombianas, incluyo a *Croton floccosus* en la sección *Cyclostigma*.

Key words: *Croton floccosus*, Ecuador, Euphorbiaceae, section *Cyclostigma*.

Croton is a genus in the Euphorbiaceae containing over 1200 species of herbs, shrubs, and trees that is particularly diverse in South America (Govaerts et al., 2000). *Croton* sect. *Cyclostigma* Grisebach (sensu Webster, 1993) contains roughly 50 species that are distributed in tropical and subtropical regions of Mexico, Central America, and South America. Section

Cyclostigma is commonly referred to as the dragon's blood (sangre de drago) group due to the presence of red latex in many of the species, which is used by indigenous peoples and colonists for a wide range of ailments. During a revision of *Croton* sect. *Cyclostigma* in Ecuador, a number of collections from areas west and north of Quito were determined to represent a species not formally described.

Croton floccosus B. A. Smith, sp. nov. TYPE: Ecuador. Prov. Pichincha: Cantón Quito, 10 km W of Nanegalito on rd. to Puerto Quito, 78°45'W, 00°02'S, 1820 m, July 1994, B. A. Smith 224 (holotype, DAV; isotypes, MO, NY, QCNE, WIS). Figure 1.

Haec species ex affinitate *C. polycarpi*, foliis floccosis lamina basi glandulosa, stipulis subintegris, staminibus 15 ad 16, petalorum apice glanduloso distinguenda.

Tree up to 25 m high, trunk slender with a spreading crown; bark white; latex red or occasionally light orange in young branches; indumentum on young branches golden brown with dense covering of dendritic and rosulate trichomes. Leaf blades coriaceous, dark green, adaxial surface of young leaves densely covered with golden-yellow floccose indumentum of dendritic and rosulate trichomes, becoming glabrous to subglabrous on mature leaves, abaxial surface with dense white indumentum; leaves ovate or occasionally almost elliptical, 7–23 × 3.5–12 cm, length:width ratio 1.3–2.7:1, tip acuminate, margin entire or very seldom slightly denticulate or crenulate, margin with small sessile glands, base rounded, sometimes truncate or weakly cordate; venation ± actinodromous with 2 basal secondary veins at lower angles of origin than the other 7 to 14 secondary vein pairs, one or more intersecondary veins usually present, tertiary veins percurrent, weakly sinuous or retroflexed, occasionally forked; adaxial surface with main vein raised, rarely secondary veins raised, abaxial surface with primary, secondary, and tertiary veins raised; foliar glands 2 to 6 and acropetiole, gland number varying on individuals, usually with one pair of glands positioned on the abaxial surface of

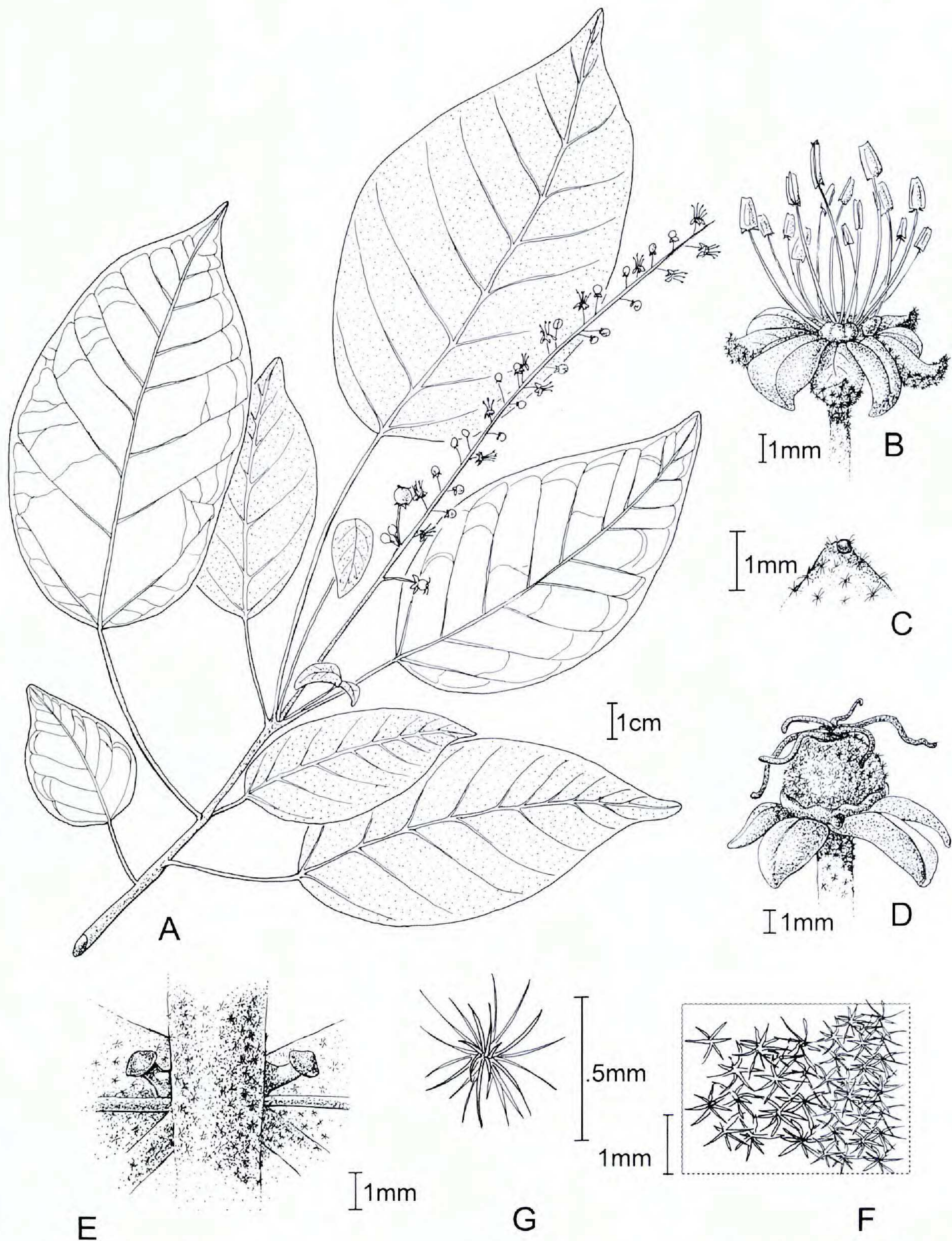


Figure 1. *Croton floccosus* B. A. Smith. —A. Branch with female and male flowers. —B. Male flower. —C. Tip of petal from male flower showing terminal gland and multiradiate trichomes. —D. Female flower. —E. Base of leaf showing paired stipitate abaxial glands and dense indumentum (petiole extends upward). —F. Abaxial leaf surface with dense indumentum of rosulate and multiradiate trichomes. —G. Detail of rosulate trichome from abaxial leaf surface (B. A. Smith 224, DAV).

leaf and one pair of glands on the adaxial surface of the petiole near base of blade, glands sessile to stipitate, less than 2 mm long and terminally convex; petioles 2.5–15 cm long with dense indumentum of dendritic or rosulate trichomes, petiole:leaf length ratio 0.25–1:1; stipules weakly persistent, lanceolate to almost linear, 4–7(–11) × 0.5–1.1 mm, margin entire to dentate, glandular, with indumentum of rosulate trichomes. Inflorescences terminal, erect,

25–30 cm long, cymules with 1 to 3 flowers, rachis angular, golden brown with dense covering of dendritic trichomes, lower cymules bisexual with only 2 or 3 staminate flowers and lowest few cymules sometimes strictly pistillate; pistillate bracts widely triangular ca. 1 mm long and 1 mm wide; staminate bracts setaceous, less than 1 mm long. Staminate flowers with pedicels 7–16 mm; sepals valvate, ovate, and acute, lobe of sepal 2.5–4.1 × 1.5–2.1 mm,

Table 1. Character states described in original species descriptions. Descriptions in parentheses are from the author's observations of type specimens (! = confirmed by author).

Character	<i>Croton polycarpus</i>	<i>Croton magdalenensis</i>	<i>Croton mutisianus</i>
Style	multifid (bifid with short laciniate tips)	bifid (!)	bifid (!)
Stamen number	ca. 20(17)	ca. 25	14 to 15 (could not be confirmed)
Stipule margin	pinnatifid (dentate to deeply pinnate)	denticulate (to subpinnate)	no mention of margin (could not be determined)

adaxial surface of sepal glabrous, abaxial surface with dense indumentum of rosulate and/or multiradiate trichomes, edges lanate; petals ovate to elliptic, cream-colored, 3–4.1 × 1.2–2.2 mm, tip of petal with tiny terminal gland, adaxial surface of petal glabrous, abaxial surface with sparse to dense covering of multiradiate trichomes with long rays, edges lanate; receptacle with a few trichomes to densely pilose; nectary lobes with emarginate tips; stamens 15 or 16(to 18); filaments 3.9–4.7 mm long with a few simple trichomes; anthers ca. 1 mm long. Pistillate flowers with pedicels 11–24 mm; sepals oblong to slightly obovate, valvate, tip acute, sepal lobes 4.1–4.7 × 1.8–2.7 mm, adaxial surface of sepals with a few multiradiate trichomes, abaxial surface densely covered with rosulate trichomes; malformed petals generally present though sometimes reduced to a stalked or sessile gland (some specimens with petals, stalked glands, and sessile glands on different female flowers of the same plant); ovary with rosulate or multiradiate trichomes, these may be subporrect or porrect; styles once bifid, forking near the base, tips of styles flattened, base of styles with multiradiate hairs. Fruits globose, brown, ca. 6–7.5 mm high, 6.4–7.7 mm wide; columella 4.9–7.2 mm long; seeds brown with rugose surface, 4–5.1(–7) × 3.2–5.0 mm; caruncle 0.9–1.2 × 1.3–1.9 mm.

Taxonomy and variation. *Croton floccosus* appears to be closely related to the Colombian species *Croton magdalenensis* Müller Argoviensis, *C. polycarpus* Benth, and *C. mutisianus* Kunth. It is difficult to differentiate these Colombian species from one another, and it was Croizat (1944) who first suggested that these species may better be treated as varieties of *C. polycarpus*. A paucity of field collections has made it difficult to assess the relationships among these three species. Based on the descriptions of *C. polycarpus*, *C. magdalenensis*, and *C. mutisianus* (Benth, 1839; Müller, 1866; von Humboldt et al., 1817, respectively), they appear to be separated based primarily on differences in style branching, stamen number, and stipule morphology. A review of type specimens for *C. polycarpus*, *C. magdalenensis*, and *C. mutisianus* (Hartweg 1373

(K); *Triana 3631* (W); *Mutis s.n.* (US), respectively), reveals that these characters may not differ as much as previously indicated (Table 1). Style branching is very similar among the three species, but the essentially bifid styles of *C. polycarpus* have short lacinate tips. The stamen number of *C. mutisianus* (14 or 15) is significantly less than the (17 to)20 to 25 found in the other two species, but I could not confirm this number on the type specimen. Of the 44 specimens reviewed from Colombia, which fit into this species complex, I did not find any collections with less than 17 stamens. The stipules are quite variable, ranging from denticulate to pinnatifid even on an individual plant. Additional collections may support Croizat's (1944) idea of subsuming all three species into *C. polycarpus*. *Croton floccosus* has a number of staminate flower characters that distinguishes it from the *C. polycarpus* species complex. These differences include gland-tipped petals, a longer pedicel, and fewer stamens (Table 2). *Croton coriaceus* Kunth, which is also in section *Cyclostigma*, is sympatric with *C. floccosus* and has floccose indumentum on young leaves, but *C. coriaceus*, unlike *C. floccosus*, has fasciculate hairs on mature leaves and clear to translucent yellow latex.

Distribution and ecology. *Croton floccosus* is confined to Pichincha and Imbabura provinces in Ecuador between the elevations of (600–)1150 and 2400(–3300) m. It has not been collected on the well-traveled Quevedo to Latacunga road in Cotopaxi province, but it would not be surprising to find populations of this species in the northern portion of Cotopaxi province, where a lack of roads has prevented adequate collecting. Trees are common in disturbed areas along roadsides, streams, and in pastures. The abundance of *C. floccosus* in pastures may be due to planting by colonists who use the latex of this species in similar ways to *C. lechleri* Müller Argoviensis. See Jones (2003) for a review of uses for *C. lechleri*.

Phenology. Flowering February to November; fruiting February to November.

Paratypes. ECUADOR. **Imbabura:** cantón Cotacachi, carr. Apuela–Cotacachi, W. Palacios, C. Aguayo 4840 (QCNE); carr. Cotacachi a Apuela, D. Rubio & C. Quelal

Table 2. Comparison of *Croton floccosus* with *C. polycarpus* species complex. *Croton polycarpus* species complex includes collections identified as *C. magdalenensis*, *C. polycarpus*, and *C. mutisianus*.

Character	<i>C. floccosus</i> (Ecuador)	<i>C. polycarpus</i> complex (Colombia)
♂ flower: terminal gland on petal	present	absent
♂ flower: length of pedicel	7–16 mm	2.5–7 mm
Stamen number	15 to 16(to 18)	(17 to)22 to 25
Trichomes on filaments	simple hairs present	glabrous
Fruit diameter (mm)	6.4–7.7	9–13
Stipule margin	entire to dentate	denticulate to pinnately lobed

587 (QCNE); parroquia Apuela, *G. Tipaz & C. Aulestja* 1642 (DAV, QCNE). **Pichincha:** cantón Santo Domingo, Old Santo Domingo rd. 4.5 km W of Chiriboga, *B. Smith & G. Webster* 101 (DAV, QCNE); cantón Quito, Maquipucuna reserve, 200 m S of parking area for res. station, next to Umachaca river, *B. Smith & M. Geary* 306 (DAV, QCNE); 11.2 km E of Nanegalito on rd. to Calacali, *B. Smith & M. Geary* 307 (DAV, QCNE); rd. from Quito to Santo Domingo next to rd., *B. A. Smith* 106 (DAV, QCNE); rd. from Quito–Nono–Nanegalito, 31.4 km from turnoff onto rd., *B. A. Smith* 201 (DAV, QCNE); 4 km W of turnoff onto Calicali–Nanegalito rd. coming from Nono, *B. A. Smith* 221 (DAV, QCNE); 22.5 km W of Nanegalito on rd. to Puerto Quito, *B. A. Smith* 223, 224, 225 (DAV, QCNE); 21.3 km W of Nanegalito on rd. to Puerto Quito, *B. A. Smith* 226 (DAV, QCNE); 26.3 km W. of Nanegalito on rd. to Puerto Quito, *B. A. Smith* 227 (DAV, QCNE); Maquipucuna, *G. Tipaz & C. Quelal* 188 (QCNE); Maquipucuna, parcela permanente de 1 hectárea, *C. Quelal & G. Tipaz* 135 (DAV, QCNE); 5.5 km by rd. W of Tandayapa, *G. Webster, M. Rios & B. Castro* 28376 (DAV, QCNE); Carr. Calacali–Nanegalito, *E. Gudiño, D. Rubio, G. Tipaz & C. Quelal* 1412 (QCNE); Carr. Nono–Nanegalito, *H. Balslev & B. Boom* 2480 (NY, QCNE); Maquipucuna, *G. L. Webster* 32816 (DAV); Santo Domingo, Parroquia Tandapi, *C. Cerón* 6909 (MO, QCNE); km 65, carr. vieja vía Chiriboga Quito–Santo Domingo, *C. Dodson, A. Gentry, W. Palacios & J. Zaruma* 14370 (DAV, MO, QCNE); km 96–94 old road to Santo Domingo, *C. Dodson & A. Gentry* 9686 (DAV, MO, QCNE); Rt. de Aloag a Santo Domingo, *Ch. Huttel* 1065 (QCNE); Road La Union del Toachi–San Francisco de las Pampas, km 3, *G. Harling & L. Anderson* 23141 (GB); Santo Domingo–Tandapi, km 14, *G. Tipaz & J. Zuleta* 912 (DAV); along new rd. Nanegal–Mindó, *H. van der Werff, B. Gray & P. Fuentes* 13379 (QCNE); Río Guajalito, *J. Jaramillo & V. Zak* 7839 (DAV); reserva flor.-ecol. Río Guajalito, km 59, carr. antigua Quito–Sto. Domingo, 3.5 km al NE de la carr., *J. Jaramillo & V. Zak* 7848 (DAV); *V. Zak*

5513, 5514 (DAV, MO, QCNE); carr. Quito–Lloa–Mindó, *V. Zak & J. Jaramillo* 2136 (DAV); carr. Quito–Nono–Tandayapa–Pto. Quito, entre Nonoy Tandayapa, *V. Zak & J. Jaramillo* 3070 (DAV, MO).

Acknowledgments. This research was funded by a grant from the University Research Expeditions Program (UREP) at the University of California and a grant from Shaman Pharmaceuticals, Inc. I thank Gordon McPherson and an anonymous reviewer for helpful comments on the manuscript. I also thank Bobbi Jo Goodman for the illustration.

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